WHAT IS CLAIMED IS:

1. A method for making a field-effect semiconductor device comprising the steps of:

forming a gate electrode on a semiconductor layer comprising a gallium nitride-based compound semiconductor represented by the formula $Al_xIn_yGa_{1-x-y}N$, wherein x + y = 1, $0 \le x \le 1$, and $0 \le y \le 1$; and

forming a source electrode and a drain electrode by self-alignment using the gate electrode as a mask.

- 2. A method for making a field-effect semiconductor device according to Claim 1, wherein, in the step of forming the gate electrode, the gate electrode is formed into a predetermined pattern, and in the step of forming the source electrode and the drain electrode, the source electrode and the drain electrode by vapor deposition using an electrode material.
- 3. A method for making a field-effect semiconductor device according to Claim 1, wherein the gate electrode has a T-shaped cross section, and the source electrode and the drain electrode are formed so as to be lower than the bottom face of an overhang of the T-shaped gate electrode.

- 4. A method for making a field-effect semiconductor device according to Claim 2, further comprising, after the step of forming the source electrode and the drain electrode, a step of removing the electrode material deposited on the gate electrode.
- 5. A method for making a field-effect semiconductor device according to Claim 2, wherein at least a part of the gate electrode comprises a high-melting-point metal.
- 6. A method for making a field-effect semiconductor device according to Claim 5, wherein the gate electrode has a multi-layered structure, and the multi-layered structure comprises a layer comprising the high-melting-point metal.
- 7. A method for making a field-effect semiconductor device according to either Claim 5 or 6, wherein the high-melting-point metal comprises at least one metal selected from the group consisting of Mo, Pt, W, Hf, and Cr.
- 8. A method for making a field-effect semiconductor device according to Claim 6, wherein the layer comprising the high-melting-point metal has a thickness of 200 nm or more.

9. A method for making a field-effect semiconductor device according to Claim 1, wherein the semiconductor layer comprises a spacer layer, a Si-containing carrier-supplying layer, and a cap layer; the spacer layer, the Si-containing carrier-supplying layer, and the cap layer comprising the gallium nitride-based compound semiconductor represented by the formula $Al_xIn_yGa_{1-x-y}N$; and the spacer layer, the Si-containing carrier-supplying layer, and the cap layer are deposited in that order on a GaN-based channel layer,

wherein the gate electrode, the source electrode, and the drain electrode are formed on the cap layer.

- 10. A field-effect semiconductor device comprising:
- a semiconductor layer comprising a gallium nitride-based compound semiconductor represented by the formula $\mathrm{Al}_{\mathbf{x}}\mathrm{In}_{\mathbf{y}}\mathrm{Ga}_{1-\mathbf{x}-\mathbf{y}}\mathrm{N}, \text{ wherein } \mathbf{x}+\mathbf{y}=1,\ 0\leq\mathbf{x}\leq1, \text{ and } 0\leq\mathbf{y}\leq1;$
 - a gate electrode formed on the semiconductor layer; and
- a source electrode and a drain electrode formed by self-alignment using the gate electrode as a mask.
- 11. A field-effect semiconductor device according to Claim 10, wherein the gate electrode has a predetermined pattern, and the source electrode and the drain electrode are formed by vapor deposition using an electrode material.

- 12. A field-effect semiconductor device according to Claim 10, wherein the gate electrode has a T-shaped cross section, and the source electrode and the drain electrode are lower than the bottom face of an overhang of the T-shaped gate electrode.
- 13. A field-effect semiconductor device according to Claim 11, wherein the electrode material deposited on the gate electrode is removed after the formation of the source electrode and the drain electrode.
- 14. A field-effect semiconductor device according to Claim 11, wherein at least a part of the gate electrode comprises a high-melting-point metal.
- 15. A field-effect semiconductor device according to Claim 14, wherein the gate electrode has a multi-layered structure, and the multi-layered structure comprises a layer comprising the high-melting-point metal.
- 16. A field-effect semiconductor device according to either Claim 14 or 15, wherein the high-melting-point metal comprises at least one metal selected from the group consisting of Mo, Pt, W, Hf, and Cr.

- 17. A field-effect semiconductor device according to Claim 15, wherein the layer comprising the high-melting-point metal has a thickness of 200 nm or more.
- 18. A field-effect semiconductor device according to Claim 10, wherein the semiconductor layer comprises a spacer layer, a Si-containing carrier-supplying layer, and a cap layer; the spacer layer, the Si-containing carrier-supplying layer, and the cap layer comprising the gallium nitride-based compound semiconductor represented by the formula $\mathrm{Al}_{\mathbf{x}}\mathrm{In}_{\mathbf{y}}\mathrm{Ga}_{1-\mathbf{x}-\mathbf{y}}\mathrm{N}$,

wherein the field-effect semiconductor device further comprises a GaN-based channel layer, and the spacer layer, the Si-containing carrier-supplying layer, and the cap layer are deposited in that order on the GaN-based channel layer,

wherein the gate electrode, the source electrode, and the drain electrode are formed on the cap layer.